



Generic Assessment Endpoints For Ecological Risk Assessments

Glenn W. Suter II, Thomas Gardner; Donald Rodier; Scott Schwenk; Michael E. Troyer; Patti Lynne Tyler; Douglas J. Urban; Marjorie C. Wellman; Steve Wharton; James White • U.S. Environmental Protection Agency

2004
EPA Science Forum

Healthy Communities and Ecosystems

INTRODUCTION

Ecological risk assessment is a process for evaluating the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors. A **critical early step in conducting an ecological risk assessment is deciding which aspects of the environment will be selected for evaluation.** This step is often challenging because of the remarkable diversity of species, ecological communities, and ecological functions from which to choose and because of statutory ambiguity regarding what is to be protected. This poster describes a new Risk Assessment Forum publication which builds on existing EPA guidance and experience to assist those who are involved in ecological risk assessments in carrying out this step, which in the parlance of ecological risk assessment is termed “selecting assessment endpoints.” This document describes a set of endpoints, known as generic ecological assessment endpoints (GEAEs), that can be considered and adapted for specific ecological risk assessments. The GEAEs are not exhaustive or mandatory, but are provided to assist EPA scientists and risk management decisions, as well as, ecological risk assessors outside the Agency.

ECOLOGICAL "ASSESSMENT ENDPOINTS" AT EPA

- 1989: Defining an “assessment endpoint” involves two steps: identifying the valued attributes of the environment at risk, and defining these valued attributes in operational terms (Suter 1989).
- 1992: This concept was adopted in the *Framework for Ecological Risk Assessment* (USEPA 1992). “Assessment endpoints are explicit expressions of the actual environmental value that is to be protected.”
- 1994: “EPA needs to establish an initial, overall set of ecological concerns to be considered in the development of regulations, policies, and assessment endpoints for ecological risk assessments.” *Managing Ecological Risks at EPA: Issues and Recommendations for Progress* (Troyer and Brody 1994).
- 1997: “A common list of entities and ecological principles for the entire Agency can provide many advantages...” *Priorities for Ecological Protection: An Initial List and Discussion Document for EPA* (Barton, et al. 1997).
- 1998: Assessment endpoint concept expanded in the final *Guidelines for Ecological Risk Assessment* as “explicit expressions of the actual environmental value that is to be protected, operationally defined by an ecological entity and its attributes” (USEPA 1998).
- 2003: EPA's Risk Assessment Forum publishes the supplemental guidance entitled: *Generic Ecological Assessment Endpoints* (GEAEs) for *Ecological Risk Assessment* authored by a technical workgroup composed from EPA's program, regional, and science offices.

GENERIC ECOLOGICAL ASSESSMENT ENDPOINTS (GEAEs)

- ☐ ☐ - Applicable to a wide range of ecological risk assessments.
- ☐ ☐ - Reflect the policies and goals of the Environmental Protection Agency.☐
- ☐ ☐ - Useful for a wide array of issues.
- ☐ ☐ - Can be estimated using existing assessment tools.

WHAT GEAEs ARE NOT

- Not a complete list of what the EPA protects.
- ☐ • Not, by exclusion, an indication of what is not protected.
- ☐ • Not mandatory.
- ☐ • Not applicable without assessment-specific interpretation.

WHY GEAEs?

- To give risk managers a **basis for action** similar to commonly employed human health endpoints.
- To provide a **threshold for preventing of environmental degradation**, by ensuring that certain values are at least considered for assessment.
- To **comply with legal requirements**.
- To **improve consistency** of ecological risk assessment and management.
- To serve as models for site-, action-, or region-specific endpoints.
- To provide **clear direction** for the development of methods and models.
- To **facilitate communication** with stakeholders, by creating a set of familiar and clear generic endpoints.
- To **reduce the time and effort** required to conduct assessments.

CRITERIA FOR GEAEs

- ☐ • Generally useful in EPA's decision making process as specified in existing:
 - ☐ ☐ Precedents
 - ☐ ☐ Policies
 - ☐ ☐ Regulations
 - ☐ ☐ Legal decisions, and
 - ☐ ☐ Guidance
- ☐ • Practical in terms of measurements, testing or modeling
- ☐ • Well defined. Each GEAE has a clear ecological entity and attribute of concern.

GENERIC ECOLOGICAL ASSESSMENT ENDPOINTS		
Entity	Attribute	Identified EPA precedents
Organism-level endpoints		
Organisms (in an assessment population or community)	Kills (mass mortality, conspicuous mortality)	Vertebrates
	Gross anomalies	Vertebrates Shellfish Plants
	Survival, fecundity, growth	Endangered species Migratory birds Marine mammals Bald and golden eagles Vertebrates Invertebrates Plants
Population-level endpoints		
Assessment population	Extirpation	Vertebrates
	Abundance	Vertebrates Shellfish
	Production	Vertebrates (game/resource species) Plants (harvested species)
Community and ecosystem-level endpoints		
Assessment communities, assemblages, and ecosystems	Taxa richness	Aquatic communities
	Abundance	Coral reefs Aquatic communities
	Production	Plant assemblages
	Area	Wetlands Coral reefs Endangered/rare ecosystems Wetlands Aquatic ecosystems
Officially designated endpoints		
Critical habitat for threatened or endangered species Special places	Area Quality Ecological properties that relate to the special or legally protected status	e.g., National Parks , National Wildlife Refuges , Great Lakes

*Bold indicates protection by federal statute.

NEW TERMS: ASSESSMENT POPULATIONS & COMMUNITIES

- **Assessment Population** – A group of conspecific organisms occupying an area that has been defined as relevant to an ecological risk assessment.
- **Assessment Community or Assemblage** – A multispecies group of organisms occupying an area that has been defined as relevant to an ecological risk assessment.

HOW TO USE GEAEs FOR SPECIFIC SITES OR ACTIONS

Developing assessment endpoints for an ecological risk assessment, requires bringing together five types of information and answer questions related to each.

1. **Stressor characteristics.** What, ecologically, is susceptible to the stressor? For example, benthic invertebrates are susceptible to dredging, birds are susceptible to granular pesticides, wetlands are susceptible to filling, and so on.
2. **Ecosystem and receptor characteristics.** What is present and ecologically relevant? For site-specific assessments, this is the species, communities, or ecosystems at the site. For other assessments, the scenario should define the receptors.
3. **Management goals.** What is relevant to the management goals? Statements of management goals should suggest the changes in attributes of ecological entities that would preclude achieving the goal.
4. **Input by interested parties.** What is of concern? If interested parties make their preferences known, their concerns about particular ecological effects should be considered.
5. **GEAEs and new policies or precedents.** What is supported by policy or precedent? The GEAEs provide a set of entities and attributes that express national goals and values at the time of publication.

No formal procedure is prescribed for answering these questions or developing a list of assessment endpoints.

FUTURE PROGRESS

- Add new GEAEs
 - ☐ ☐ - As laws change
 - ☐ ☐ - As science advances
 - ☐ ☐ - As policy advances
 - ☐ ☐ - As ecological endpoints gain greater acceptance

GENERIC ENDPOINTS ARE GOOD FOR ASSESSORS

- GEAEs can promote the development of ecological risk assessment by helping assessors to focus on
 - ☐ - What to test (test development)
 - ☐ - What to observe (monitoring methods)
 - ☐ - What to model (model development)

GOOD ENDPOINTS ARE GOOD FOR MANAGERS

- Risk managers must understand what they are protecting.
- Decision-makers should understand, feel comfortable with, and support the Ecological Assessment Endpoints.
- GEAEs relieve the relative unfamiliarity associated with ecological endpoints in risk assessments.

REFERENCES

Suter, G.W., II. 1989. Ecological endpoints. In: U.S. EPA. Ecological assessments of hazardous waste sites: A field and laboratory reference document. Warren-Hicks, W., B.R. Parkhurst, S.S. Baker, Jr., eds. EPA 600/3-89/013.

U.S. EPA. 1992. Framework for ecological risk assessment. EPA/630/R-92/001. Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum.

Troyer, M.E. and M.S. Brody. 1994. Managing ecological risks at EPA: issues and recommendations for progress. Washington, DC: U.S. Environmental Protection Agency. EPA/600/R-94/183. Available from: <http://www.epa.gov/ORD/WebPubs/ecorisik.pdf>.

U.S. EPA. 1997. Priorities for ecological protection: An initial list and discussion document for EPA. Washington, DC: U.S. Environmental Protection Agency. EPA/600/5-97/002. Available from: <http://pub.epa.gov/nceca/cfm/recordisplay.cfm?id=12381>.

U.S. EPA. 1998. Guidelines for ecological risk assessment. Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. EPA/630/R-95/002F. Available from: <http://pub.epa.gov/nceca/cfm/recordisplay.cfm?id=12460>.

U.S. EPA. 2003. Generic Ecological Risk Assessment Endpoints (GEAEs) for Ecological Risk Assessment. Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. EPA/630/P-02/004F. Available from: <http://pub.epa.gov/nceca/rf>.